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The Dow Chemical Company
P.O. BOX 1967
2040 Dow Center
Midland, MI 48641

EXAMINER
GOLDEN, CHINESSA T

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEPHANE COSTEUX, LINGBO ZHU,
CHRISTOPHER M. WEIKART, and THOMAS H. KALANTAR

Appeal 2016-002332
Application 13/504,561[1]
Technology Center 1700

Before PETER F. KRATZ, WESLEY B. DERRICK, and LILAN REN, *Administrative Patent Judges*.

DERRICK, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1–11 under 35 U.S.C. § 103(a).[2] We have jurisdiction pursuant to 35 U.S.C. § 6.

We REVERSE.

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[1] Appellants identify Dow Global Technologies LLC as the real party in interest. Appeal Brief filed August 5, 2015 ("Appeal Br."). 3.
[2] Pending claims 12–20 stand withdrawn from examination. Final Office Action ("Final Act."), 2.

THE INVENTION

Appellants' appealed claims relate to a polymeric foam article formed of a thermoplastic polymer matrix. Spec.[3] Abstract.

Claim 1—the sole independent claim—is representative.

> 1. A polymeric foam article comprising a thermoplastic polymer matrix defining multiple cells therein, wherein the polymeric foam article has the following characteristics:
>
> a. the thermoplastic polymer matrix contains dispersed within it nano-sized nucleating additive particles that have all dimensions that are less than 30 nanometers in length;
>
> b. possesses at least one of the following two characteristics:
>
> i. has an effective nucleation site density of at least 3 x 10^{14} sites per cubic centimeter of pre-foamed material; and
>
> ii. has an average cell size of 300 nanometers or less; and
>
> c. has a porosity percentage of more than 50 percent
>
> where the thermoplastic polymer matrix comprises a continuous thermoplastic polymer that is either a single amorphous thermoplastic polymer or blend of multiple thermoplastic polymers that forms a single amorphous phase and wherein the continuous thermoplastic polymer is 100 weight-percent of the polymer in the thermoplastic polymer matrix and wherein the polymeric foam article is further characterized by having a thickness of greater than one millimeter and by being free of a non-foamed skin and by having a homogeneous cell size distribution.

Appeal Br. (Claims Appendix) 15.

[3] Specification filed April 27, 2012.

THE REJECTIONS

The claims stand rejected under 35 U.S.C. § 103(a) as follows:

I. Claims 1, 3–9, and 11 over Thiagarajan[4] in view of Mulvaney[5] and Ramesh;[6]

II. Claim 2 over Thiagarajan in view of Mulvaney, Ramesh, and Rajendran;[7]

III. Claim 10 over Thiagarajan in view of Mulvaney, Ramesh, and Handa;[8]

IV. Claims 1 and 3–11 over Thiagarajan in view of Mulvaney and Handa; and

V. Claim 2 over Thiagarajan in view of Mulvaney, Handa, and Rajendran.

DISCUSSION[9]

Having considered the Examiner's rejection in light of Appellants' arguments, we are persuaded that the Examiner has failed to meet the Office's burden of establishing the unpatentability of the claims on appeal. For any ground of rejection, "the Examiner bears the initial burden . . . of presenting a *prima facie* case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

We focus our discussion on Rejections I and IV.

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[4] Thiagarajan et al., US 2009/0148665 A1, published June 11, 2009.
[5] Mulvaney, US 3,975,473, issued August 17, 1976.
[6] Ramesh et al., US 2005/0042437 A1, published February 24, 2005.
[7] Rajendran et al., US 2009/0247654 A1, published October 1, 2009.
[8] Handa et al., US 7,045,556 B2, issued May 16, 2006.
[9] We refer to the Specification, the Final Office Action, the Appeal Brief, the Examiner's Answer issued December 16, 2015 ("Ans."), and the Reply Brief filed December 21, 2015 ("Reply Br.").

Rejection I (and Rejections II & III)

The Examiner relies on Thiagarajan, *inter alia*, for its disclosure relating to a polymeric foam article comprised of a thermoplastic polymer matrix and having cells of from about 10 nanometers to about 500 nanometers. Ans. 2–3 (citing Thiagarajan ¶¶ 1, 7, 56).

The Examiner relies on Mulvaney for its teaching of nucleating agents having a particle size of about 0.01 microns (10 nanometers) in a polymeric foam article to meet the limitation of nano-sized nucleating additive particles that have all dimensions that are less than 30 nanometers in length. Ans. 3 (citing Mulvaney, col. 1, ll. 5–10, col. 3, ll. 48–56, col. 4, ll. 4–15). The Examiner further relies on the teaching that Mulvaney's foam article has uniform physical properties and porosity to meet the recited homogenous cell size distribution. Ans. 3 (citing Mulvaney, col. 2, ll. 4–12, 55–66).

The Examiner relies on Ramesh for teaching a foam article thickness of greater than one millimeter and for teaching a foam with a porosity percentage of more than 50%. Ans. 3–4 (citing Ramesh ¶¶ 3, 7, 8, 11). Observing that Ramesh recites an average cell size of at least about 0.01 mm, the Examiner further determines that Ramesh's polymeric foam article has an average cell size of about 10 nm. Ans. 14 (citing Ramesh ¶ 9).

The Examiner further finds that "Thiagarajan, Mulvaney, and Ramesh are analogous because they disclose a polymeric foam comprising a thermoplastic polymer." Ans. 4.

The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time of the invention to have incorporated the nucleating particles of Mulvaney into the polymeric foam article of Thiagarajan to obtain the benefit of the fine particles as nucleating sites and

to modify the porosity and thickness of the polymeric foam article to that of Ramesh to obtain a useful foam for various specified purposes. Ans. 4.

Appellants proffer that the Examiner has erred in finding that Ramesh discloses the level of porosity required by the claims and that the Examiner has failed to establish the requisite reasonable expectation of success in the relied on combination. Appeal Br. 7–12.

As to the level of porosity, Appellants' argument highlights the Examiner's error in relying on the disclosed percentages of closed and open cells (of the total cells) for meeting the limitation of a "porosity percentage of more than 50 percent." As maintained by Appellants, porosity is a measure of void volume within the foam. *See, e.g.*, Spec. 2, l. 12 ("Porosity, the ratio of void volume to foam volume . . ."); 6, l. 4 ("Porosity serves as a measure of void volume fraction in a foam article."). The Examiner's maintained reliance on disclosure relating to the percentage of open and/or closed cells does not address the amount of void within the polymeric foam. Ans. 16–17.

On this record, accordingly, it is manifest that the Examiner has failed to articulate the requisite reasoning grounded on fact to establish a prima facie case. We note, however, that while not relied on by the Examiner, perhaps due wholly to the error as to the proper meaning of porosity, Thiagarajan itself includes relevant disclosure as to the porosity of its foam article. *See, e.g.*, Thiagarajan, Abstract, ¶¶ 5, 7 (describing articles with a foam density that is from about 1 or 5 percent to about 50 percent of the bulk density of the material of the nanocellular foam). As noted above, however, the rejection before us is not premised on the latter porosity disclosure of Thiagarajan for teaching or suggesting a porosity value that may correspond

to the claimed porosity limitation and, as indicated below, this is not the only substantive error in the Examiner's rejection.

As to the reasonable expectation of success, Appellants identify a further factual error—the finding that Ramesh discloses a foam with pore sizes of 10 nanometers—and proffer arguments that highlight the absence of relied on teachings for a uniform nanocellular foam being formed using nano-sized nucleating particles or being formed in a thickness of greater than one millimeter. Appeal Br. 10. We are directed to no evidence that the foam in Mulvaney was a nanocellular foam or to sufficient explanation by the Examiner why the nano-sized nucleating particles in Mulvaney would reasonably be expected to form a nanocellular foam such as that in Thiagarajan or according to the claims. *See generally* Final Act.; Ans. In particular, as to reasonably expecting formation of a nanocellular foam, the Examiner fails to establish that the nucleating particles in Mulvaney are the same as those disclosed as suitable in the instant Specification and also fails to establish any basis why differences in nucleating particles would be immaterial as to their nucleating and pore forming effect.[10] Likewise, in establishing merely that the polymers in Thiagarajan, Mulvaney, and Ramesh are thermoplastic polymers, there is insufficient explanation as to the differing polymers being formed into the nanocellular foams and how the nano-sized particles in Mulvaney would function as nucleating particles to provide the claimed foam. *See generally* Final Act.; Ans.

[10] Mulvaney includes a listing of suitable nucleating agents (col. 4, ll. 14–19) which appear to differ from those identified in the Specification as being particularly suitable (Spec. 9, ll. 3–7).

Because the rejection lacks sufficient explanation as to how the nucleating particles in Mulvaney would be expected to provide a nanocellular foam, including, for example, on the basis of similarity to those used in the instant application, the Examiner's articulated reasoning falls short of that necessary for a prima facie case. *See In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) ("The Patent Office has the initial duty of supplying the factual basis for its rejection. It may not . . . resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis."); *In re Sporck*, 301 F.2d 686, 690 (CCPA 1962); *see also Oetiker*, 977 F.2d at 1445.

On this record, accordingly, we are unable to sustain the Examiner's Rejection I. Having also persisted in the same errors in Rejections II and III, we are likewise unable to sustain these rejections. We decline to scour the record in the first instance for facts that might support the rejection, as our primary role is review, not examination *de novo*.

Rejection IV (and Rejection V)

The Examiner relies on Thiagarajan and Mulvaney as explained above for Rejection I. *Compare* Ans. 3–4, *with id.* at 9–11.

The Examiner relies on Handa for its disclosure of a polymeric foam article comprising a thermoplastic polymer matrix defining multiple cells. Ans. 10 (citing Handa, col. 1, ll. 55–60, col. 2, ll. 1–3, col. 6, ll. 39–51). The Examiner determines that the disclosed greater than 85% closed cells read on the recited porosity percentage of more than 50 percent. Ans. 10 (citing Handa, col. 6, ll. 48–51). The Examiner further relies on Handa for the recited foam article thickness of greater than one millimeter. Ans. 10–11 (citing Handa, col. 6, ll. 39–43). The Examiner further finds the

thermoplastic matrix in Handa contains dispersed nucleating agents in small particulate form. Ans. 10–11 (citing Handa, col. 2, ll. 1–3, col. 4, ll. 25–37).

The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time of the invention to have incorporated the nucleating particles of Mulvaney into the polymeric foam article of Thiagarajan to obtain the benefit of the fine particles as nucleating sites and to modify the porosity and thickness of the polymeric foam article to that of Handa to obtain a stable foam having minimized or no corrugation. Ans. 11.

As to the level of porosity, the Examiner has—as in Rejection I, as discussed above—erred in citing to disclosure in Handa relating to the percentage of closed cells for the porosity limitation (Handa, col. 6, ll. 48–51), even though Handa appears to also contain relevant disclosure as to the percentage of void volume as a percentage of the foam volume within portions of Handa cited for other purposes (*see, e.g.*, Handa, col. 6, ll. 44–48). Accordingly, while the Examiner has again failed to articulate the requisite reasoning grounded on fact to establish a prima facie case, we again note the presence of non-utilized and seemingly more relevant disclosure as to the porosity of the foam articles of Thiagarajan and of Handa. Moreover, as indicated below, even if the Examiner would have rectified this error, there is further deficiency in the stated obviousness rejection.

As to the reasonable expectation of success, Appellants rely on the arguments as to Rejection I, and further argue that the foam in Handa is also not a nanocellular foam as the disclosed foam cell size is approximately 700 micrometers. Appeal Br. 13 (citing Handa, col. 7, ll. 14–16).

The Examiner counters that the cited foam cell size of approximately 700 micrometers is only relevant as to some polyolefin foams and that this does not restrict Handa to a microcellular foam. Ans. 19–20. The Examiner fails, however, to direct us to any evidence or sufficient explanation to support the position that Handa relates to a nanocellular foam. *See generally* Final Act.; Ans. Thus, while the nucleating agents set forth in Handa include inorganic materials in small particulate form of chemical composition at least similar to those in the Specification (*compare* Handa, col. 4, ll. 35–37 *with* Spec. 9, ll. 3–7), there is an insufficient basis set forth for these providing a nanocellular foam or for the applicability of Handa's nucleating agents to provide such a foam in the cited prior art (*see generally* Final Act.; Ans.). On this record, accordingly, the Examiner has failed to establish that forming a nanocellular foam according to the claims would reasonably be expected by use of an included nano-sized nucleating particles according to Mulvaney for the reasons set forth above in our discussion of Rejection I.

Thus, the Examiner's basis for this rejection also falls short of that necessary for a prima facie case. *Warner*, 379 F.2d at 1017; *Sporck*, 301 F.2d at 690; *see also Oetiker*, 977 F.2d at 1445. Accordingly, on this record, we are also unable to sustain the Examiner's Rejection IV (and Rejection V).

CONCLUSION

The Examiner's decision rejecting claims 1–11 is REVERSED.

REVERSED